



Carolina Power & Light Company  
Robinson Nuclear Plant  
3581 West Entrance Road  
Hartsville SC 29550

Serial: RNP-RA/00-0122

**JUL 21 2000**

United States Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2  
DOCKET NO. 50-261/LICENSE NO. DPR-23

LICENSEE EVENT REPORT NO. 2000-001-00  
MANUAL REACTOR TRIP DUE TO TURBINE  
ELECTRO-HYDRAULIC CONTROL TUBING FAILURE

Ladies and Gentlemen:

The attached Licensee Event Report is submitted in accordance with the requirements of 10 CFR 50.73. Should you have any questions regarding this matter, please contact Mr. H. K. Chernoff.

Sincerely,

A handwritten signature in black ink, appearing to read "T. D. Walt".

T. D. Walt  
Plant General Manager

CAC/cac

Attachment

c: Mr. L. A. Reyes, NRC, Region II  
Mr. R. Subbaratnam, NRC, NRR  
NRC Resident Inspector, HBRSEP

A handwritten number "1522" in black ink, located in the bottom right corner of the page.

## LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT

FACILITY NAME (1)

H. B. Robinson Steam Electric Plant, Unit No. 2

DOCKET NUMBER (2)

05000261

PAGE (3)

1 of 5

TITLE (4)

MANUAL REACTOR TRIP DUE TO TURBINE ELECTRO-HYDRAULIC CONTROL TUBING FAILURE

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
06	21	2000	2000	001	00	07	21	2000	FACILITY NAME	DOCKET NUMBER
										05000
										05000
OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
			20.2201(b)			20.2203(a)(2)(v)			50.73(a)(2)(i)	50.73(a)(2)(vii)
POWER LEVEL (10)		068	20.2203(a)(1)			20.2203(a)(3)(i)			50.73(a)(2)(ii)	50.73(a)(2)(x)
			20.2203(a)(2)(i)			20.2203(a)(3)(ii)			50.73(a)(2)(iii)	73.71
			20.2203(a)(2)(ii)			20.2203(a)(4)			X 50.73(a)(2)(iv)	OTHER
			20.2203(a)(2)(iii)			50.36(c)(1)			50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)			50.36(c)(2)			50.73(a)(2)(vi)	

## LICENSEE CONTACT FOR THIS LER (12)

NAME

H. K. Chernoff, Supervisor, Licensing/Regulatory Programs

TELEPHONE NUMBER (Include Area Code)

(843) 857-1437

## COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	TG	TBG	X999	Y					

## SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On June 21, 2000, at 0257 hours EDST, the H. B. Robinson Steam Electric Plant, Unit No. 2 reactor was manually tripped from approximately 68% power. The manual reactor trip was initiated in response to leakage of main turbine system Electro-Hydraulic (EH) control system fluid. At 0210 hours an EH alarm for hi/lo-lo level occurred. Investigation of the alarm revealed an EH oil leak on non-isolable supply tubing to the hydraulic actuator for the Moisture Separator Reheater 2A Reheat Intercept Valve. Investigation of the leak revealed a circumferentially oriented crack in the EH fluid tubing. The tubing failure was caused by corrosion fatigue initiated at a defect on the outer diameter surface of the tube. The failed section of tubing was repaired. Planned corrective actions to prevent recurrence of this type of EH control system tubing failure include weather protection for selected exposed fittings, installation of flexible tubing where appropriate, and changing to a different fitting design on the 14 Main Steam and Main Turbine system valves operated by the EH system. There were no operator errors or procedural deficiencies that contributed to the event.

**LICENSEE EVENT REPORT (LER)**  
**TEXT CONTINUATION**

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H. B. Robinson Steam Electric Plant, Unit No. 2	05000261	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 5
		2000	- 001	- 00	

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

**I. DESCRIPTION OF EVENT:**

On June 21, 2000, at 0257 hours EDST, the H. B. Robinson Steam Electric Plant, Unit No. 2 reactor [RCT] was manually tripped from approximately 68% power. The manual reactor trip was initiated in response to leakage of main turbine system [TA] Electro-Hydraulic (EH) control system [TG] fluid.

On June 21, 2000, Unit No. 2 was operating at 100% power. At 0210 hours the main control room received an EH system [TG] alarm for hi/lo-lo level [LA]. Investigation of the cause of the alarm revealed an EH oil leak on non-isolable supply tubing [TBG] to the Main Steam System [SB] Moisture Separator Reheater 2A Reheat Intercept Valve [V] hydraulic actuator. Manual filling of the EH system fluid tank [TK] was initiated and the Control Room Operators started reducing power. At approximately 0255 hours, the Control Room operations personnel noted a large decrease and fluctuation in EH oil pressure and they concluded that a manual reactor trip would be prudent. A manual reactor trip was initiated at 0257 hours.

The Control Room Operators performed actions in accordance with the emergency and normal operating procedures. After the manual reactor trip, the main turbine [TA] tripped automatically and the auxiliary feedwater system [BA] actuated automatically on lo-lo water level in the steam generators [SG], which started the one steam driven and the two motor driven auxiliary feedwater pumps [P], as designed. The reactor was maintained in MODE 3, HOT STANDBY.

Investigation of the leak revealed a circumferentially oriented crack in the EH fluid tubing [TBG] (extending approximately 2/3 of the tubing circumference) at the EH system supply line connection to the hydraulic actuator for the Moisture Separator Reheater 2A Reheat Intercept Valve [V]. The failed section of tubing [TBG] was repaired prior to restart of the unit. Figure 1 shows a diagram of the tubing connection and the approximate location of the tubing leak. An investigation to determine the cause of the tubing failure was initiated on June 21, 2000. Metallurgical examination of the failure was conducted to assist the investigation. The investigation and metallurgical examination discovered evidence of both corrosion and vibration and that a material defect in the tubing was present at the failure location. The investigation also discovered that two copper inserts had been inadvertently installed in the fitting where only one is expected. The investigation concluded that the extra copper insert did not significantly contribute to this tubing failure.



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There were no structures, systems, or components inoperable at the start of this event that contributed to this event.

The reactor [RCT] was subsequently restarted at 0339 hours on June 22, 2000.

This condition is being reported in accordance with 10 CFR 50.73(a)(2)(iv) as an event that resulted in a manual actuation the reactor protection system.

**II. CAUSE OF EVENT**

This event was caused by a failure of the Main Turbine System [TA] EH System tubing [TBG]. An investigation of the cause of the tubing [TBG] failure concluded that the failure was caused by corrosion fatigue initiated at a defect on the outer diameter surface of the tube. There were no operator errors or procedural deficiencies that contributed to the event.

The investigation also revealed that approximately two weeks prior to the event, this section of tubing was observed to be vibrating more than other sections, when the insulation on this tubing was removed. The additional vibration was attributed to inadequate support for this tubing.

**III. ANALYSIS OF EVENT**

The unit was operating normally in MODE 1, prior to the EH System fluid leak. The required safety equipment performed as designed throughout this event. The auxiliary feedwater system [BA] and the turbine trip actuation operated automatically as designed.

Malfunction of the EH system can result in an event as analyzed in the Robinson Nuclear Plant, Unit No. 2 Updated Final Safety Analysis Report, Section 15.2, "Decrease in Heat Removal in the Secondary System," if a trip of the main turbine [TRB] were to occur while the reactor was still operating. The UFSAR Section 15.2 event analysis shows that the Reactor Coolant System [AB] temperature and pressure can increase after a main turbine trip. The power reduction prior to the reactor trip and operator action to trip the reactor [RCT] manually maintained the reactor and reactor coolant system parameters within the results of the UFSAR Section 15.2 analysis. The health and safety of the public was not affected.

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**IV. CORRECTIVE ACTIONS**

The broken EH system fluid line was repaired and the other two lines on this valve were disconnected and inspected, including a liquid penetrant test. The EH system fluid supply lines for the other three intercept valves were also disconnected and inspected, including a liquid-penetrant test. There were no additional problems found. An engineering walk-down of the EH system was performed. The tubing support for the tubing that failed was modified to reduce vibration.

The vertical orientation of the failed tubing may have allowed precipitation to collect on the lower fitting of the tube, potentially concentrating corrosive materials in that tube fitting. Therefore, the susceptible fittings on vertically oriented EH system tubing will be protected from precipitation by September 11, 2000. This should reduce the potential for corrosion at similar locations in the future.

Improved fittings will be installed on the 14 Main Steam System [SB] and Main Turbine System [TA] valves operated using the EH system. Flexible tubing will be installed in appropriate portions of the EH system, as determined by an engineering evaluation, to reduce the fatigue stresses on EH system tubing. These actions will be completed prior to the end of the next refueling outage (Refueling Outage 20, currently scheduled for the spring of 2001).

**V. ADDITIONAL INFORMATION****A. Failed Component Information:**

Stainless Steel Tubing [TBG], 5/8 inch outside diameter, 0.083-inch wall thickness. The manufacturer and model number is not known.

The fitting used to attach the tubing [TBG] to the valve [V] is a Parker-Hannifin Corporation, Triple-Lok 37-degree Flared Tube Fitting.

**B. Previous Similar Events:**

A review of events from the last three years did not identify a previous similar occurrence of EH system tubing failure at H. B. Robinson Steam Electric Plant Unit No. 2.

# **LICENSEE EVENT REPORT (LER)** **TEXT CONTINUATION**

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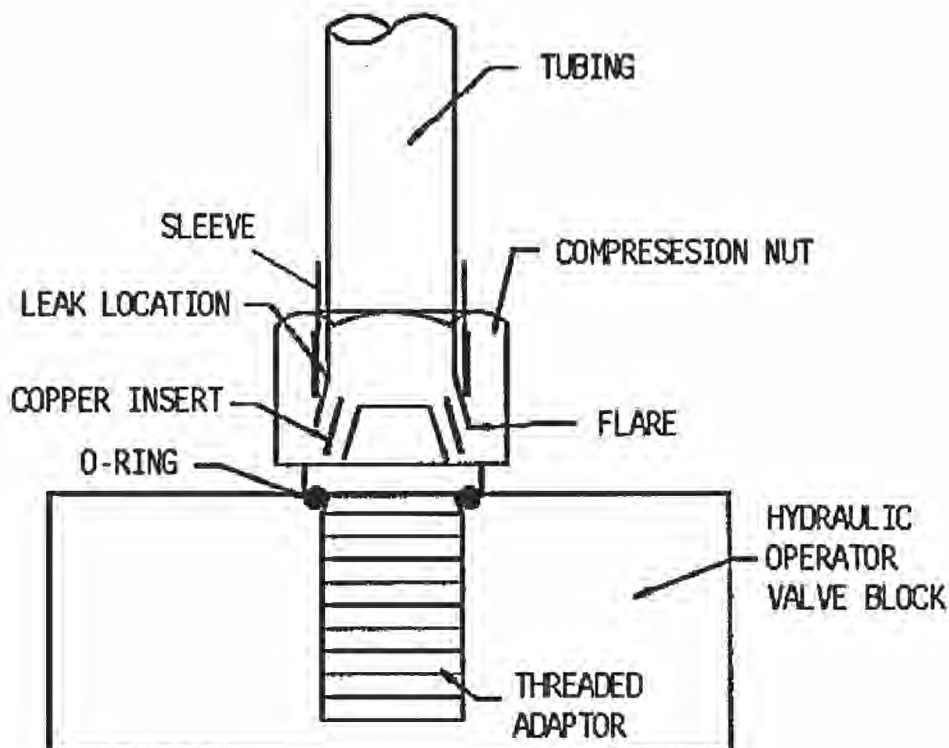


FIGURE 1: PARKER-HANNIFIN  
TRIPLE-LOK 37° FLARED TUBE FITTING  
WITH COPPER INSERT